

FEATHER ARRANGEMENT, DEVELOPMENT, AND MOLT OF
THE LONG-BILLED MARSH WREN

BY WILFRED A. WELTER

A few years ago, while doing an intensive study of the Long-billed Marsh Wren (*Telmatodytes palustris dissaepus*)¹, a series of nestlings and adult birds were collected to study the feather arrangement and development of the species. The ages of the nestling birds collected were known so that the changes from day to day will be recorded in subsequent pages. Boulton² worked out in detail the growth of feathers and the pterylography of the House Wren, and a comparable study on the Marsh Wren using his terminology and his limitations of various regions was considered worth-while.

GROWTH AND DEVELOPMENT OF NESTLING FEATHERS

For convenience in the treatment of this section the development of the feathers in the various regions will be treated separately. Plates are presented to illustrate the growth and development that has taken place during the nest life of the young.

Capital Tract

First Day. No feather development is apparent.

Second Day. Feather sheaths are visible beneath the skin in the coronal region.

Third Day. All of the sheaths are apparent beneath the skin except the auriculars. Growth proceeds forward, backward, and laterally from the coronal region.

Fourth Day. A few sheaths are now visible at the anterior end of the auricular region while those in the coronal region have pierced the skin.

Fifth Day. The sheaths are all apparent except those at the posterior margin of the auricular region.

Sixth Day. All of the sheaths have pierced the skin except those in the loreal and post-auricular regions.

Seventh and Eighth Days. All the sheaths have pierced the skin. The post-auriculars were the last to do so.

Ninth to Twelfth Days. The feather sheaths wear away during this period. Those which appeared first are usually the first to break through the sheaths. Neossopiles are still present on the tips of some of the feathers.

¹Welter, Wilfred A. The Natural History of the Long-billed Marsh Wren. WILSON BULLETIN, 47:3-34, 1935.

²Boulton, Rudyerd. Ptilosis of the House Wren (*Troglodytes aedon aedon*). Auk 44:387-414. 1927.

Spinal Tract

First and Second Days. No feather sheaths are visible.

Third Day. All of the sheaths appear beneath the skin.

Fourth Day. Sheaths in the middle expanded area have broken through the skin.

Fifth to Seventh Days. Development proceeds anteriorly from the mid-dorsal region. Those cervicals that form the anterior boundary of the spinal tract appear above the skin on the seventh day. The sheaths at the posterior boundary of the tract pierce the skin on the sixth day and then development proceeds anteriorly until it meets the mid-dorsal region.

Eighth to Twelfth Days. During this period the sheaths disintegrate or are worn away. The first feathers to appear are those in the mid-dorsal and pelvic regions. On the tenth day all of them have broken through their sheaths.

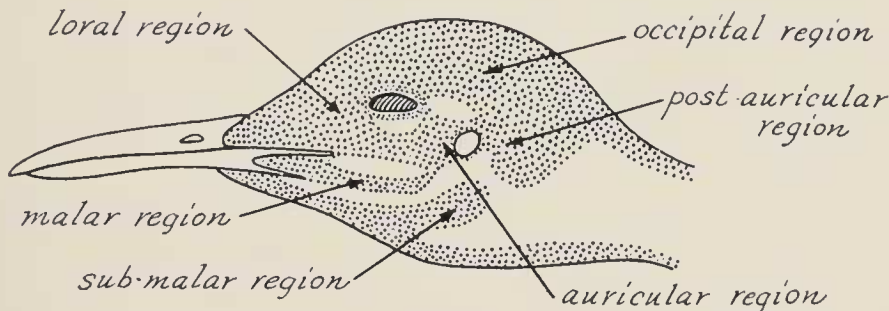


FIG. 39. Pterylography of the Marsh Wren. Lateral aspect of the head.

Caudal Tract

First and Second Days. There is no sign of feather development.

Third and Fourth Days. The rectrices and upper tail coverts are visible beneath the skin.

Fifth and Sixth Days. Sheaths of the rectrices and upper tail coverts pierce the skin on the fifth day while those of the under tail coverts appear beneath the skin during this period.

Seventh to Twelfth Days. All the feathers in this tract have now broken through the skin. The inner rectrices and their coverts appear first and then growth proceeds laterally. On the ninth day the sheaths begin to disintegrate.

Ventral Tract

First Day. There is no trace of feather development at this time.

Second Day. Sheaths on the throat and sides become visible.

Third and Fourth Days. All of the sheaths can be detected at the end of this period.

Fifth to Twelfth Days. The first sheaths to break through the skin are on the sides. Development then proceeds in both directions so that on the eighth day all of the sheaths have come through. Those located in the throat region are the most retarded. On the eighth day most of the sheaths have been broken, the appearance of the feathers follows the order of that of the sheath, those of the throat not appearing until the tenth day.

Humeral, Femoral, Crural Tracts

First Day. There is no sign of development.

Second and Third Days. The sheaths in the humeral tract are quite distinct while those in the femoral tract are just beginning to show.

Fourth Day. The humeral sheaths have broken through the skin while those in the other tracts are developing rapidly.

Fifth to Seventh Days. All of the sheaths in these regions pierce the skin during this period. Those in the anterior section of the crural tract are the last to appear.

Eighth to Twelfth Days. The tips of the feathers begin to appear on the eighth day and by the twelfth day the sheaths have been almost entirely worn away.

Alar Tract

First Day. There is no sign of development of sheaths.

Second Day. Development has gone on very rapidly as by the end of this day both primaries and secondaries have begun to break through the skin.

Third and Fourth Days. All of the primaries and the first seven secondaries have broken through the skin. The secondaries develop from the outermost inward while the primaries all develop in such rapid succession that it is impossible to say which come first. On the fourth day the under-wing coverts are visible beneath the skin.

Fifth Day. All of the flight feathers have appeared inclosed in their sheaths as have the greater coverts and the alula.

Sixth Day. The middle coverts break through the skin on this day while the lesser and marginal coverts are very pronounced beneath the skin.

Seventh Day. The middle coverts have pierced the skin, those of the secondaries preceding those of the primaries. The marginal and under-wing coverts and the lesser coverts of the secondaries have also appeared.

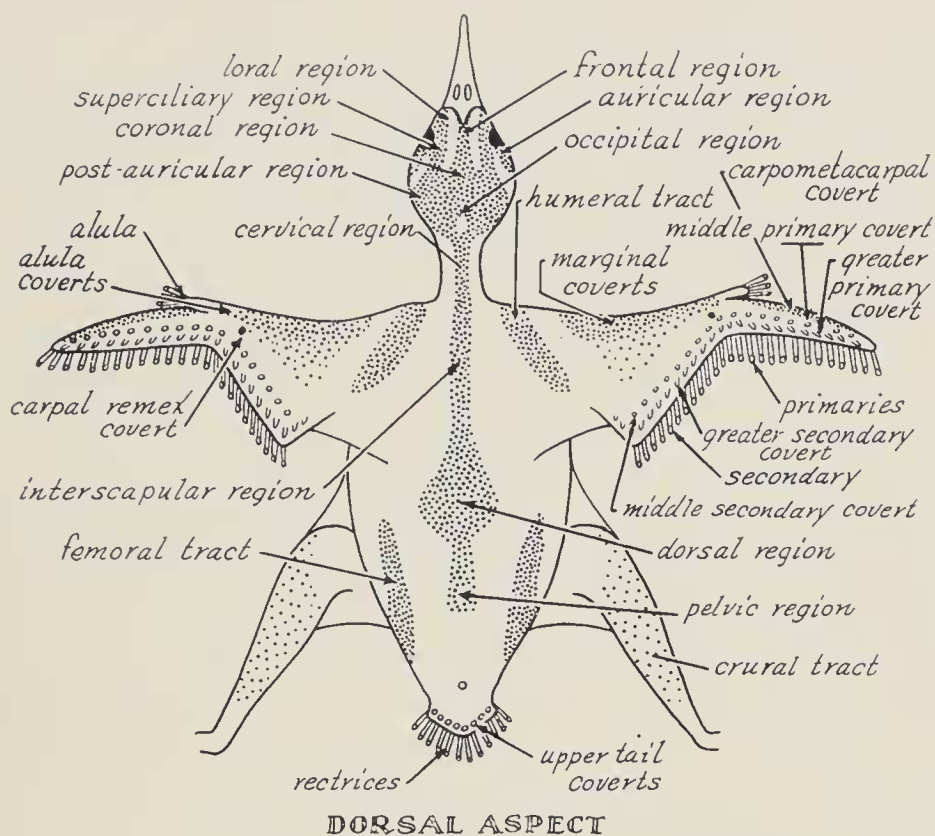


FIG. 40. Pterylography of the Marsh Wren. Dorsal aspect.

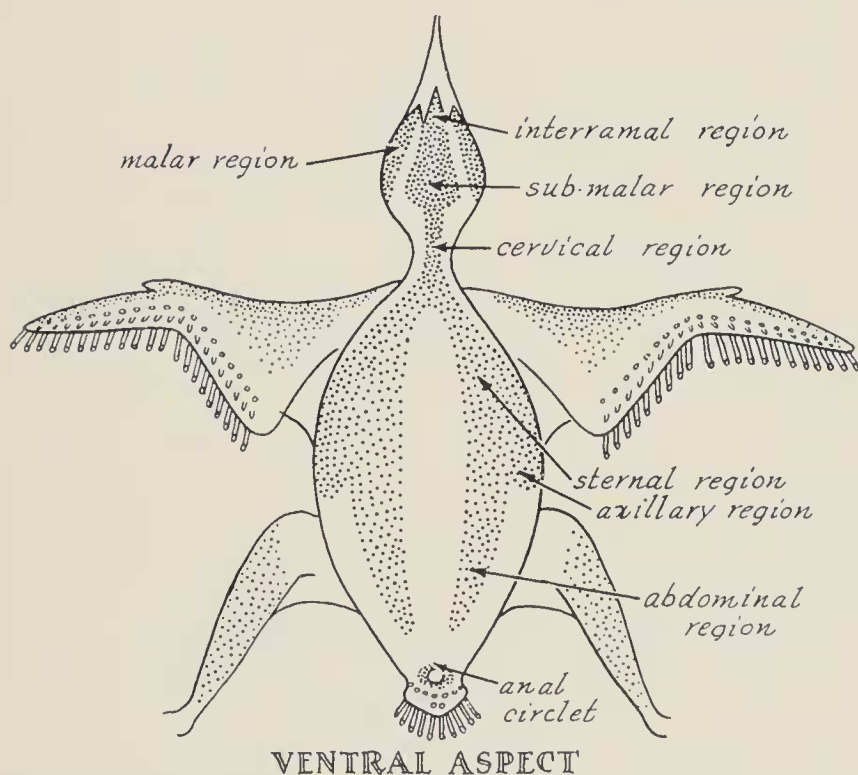


FIG. 41. Pterylography of the Marsh Wren. Ventral aspect.

Eighth Day. All of the feathers have broken through the sheaths except the ninth and tenth primaries and the marginal coverts.

Ninth to Twelfth Days. The remainder of the feathers break through the sheaths and there is a great increase in size of the flight feathers. At the end of this period portions of the sheaths may still be present on some of the primaries and secondaries.

COMPARISON

The order of appearance of the feathers of the nestlings of this species agrees very well with that of the House Wren as reported by Boulton (*op. cit.*). Development on the whole seems to take place somewhat more rapidly in the Marsh Wren. The rate of growth of various feathers in the two species parallels one another rather closely as illustrated by Fig. 42. Measurements of certain feathers were taken on the nestlings that were collected and appear in Table 1.

The percentage of ultimate growth obtained by certain feathers and fleshy parts on the twelfth day is illustrated in Fig. 42, the comparable measurements for *Troglodytes* being taken from Boulton's paper. As in the House Wren, the posterior portion of the body is much slower in developing than the anterior portion. It is also interesting to note that the tarsus has obtained practically its entire growth by the time the young bird is able to leave the nest.

PTERYLOGRAPHY

In this study of feather arrangement two methods were employed: (1) examination of preserved specimens of young birds, and (2) examination of preserved specimens of adults in which the feathers were clipped close to the body.

The arrangement of the various feathers is very similar to that of the House Wren as recorded by Boulton. Only points in which the two species differ will be discussed in the present study but complete diagrams of the pterylography of the Marsh Wren are depicted in Figs. 40-41.

In the capital tract the two species vary in the distinctness of certain apteria. Two apteria completely separate the malar region in the House Wren. In the Marsh Wren, however, a few feathers cross from the malar to the auricular region tending to terminate the upper malar apterium at its juncture with the sub-malar. Again, in the House Wren the auriculars are separated from the post-auriculars by a definite apterium while in the Marsh Wren this has become very minute and is scarcely visible.

The caudal tract differs in the number of tail-coverts. While only five pairs of upper tail-coverts are present in the House Wren, the

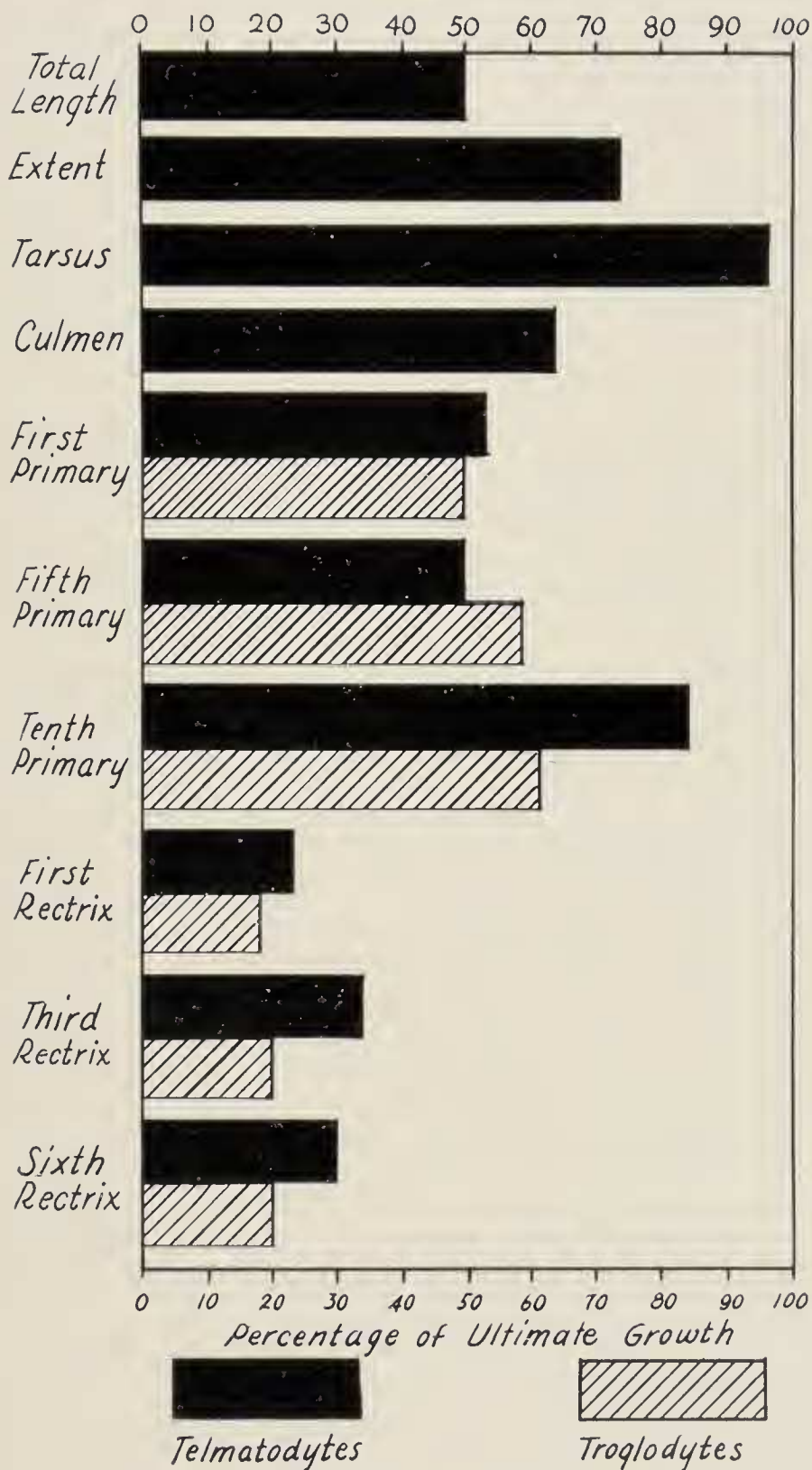


FIG. 42. A Graph showing the percentage of ultimate growth by the twelfth day.

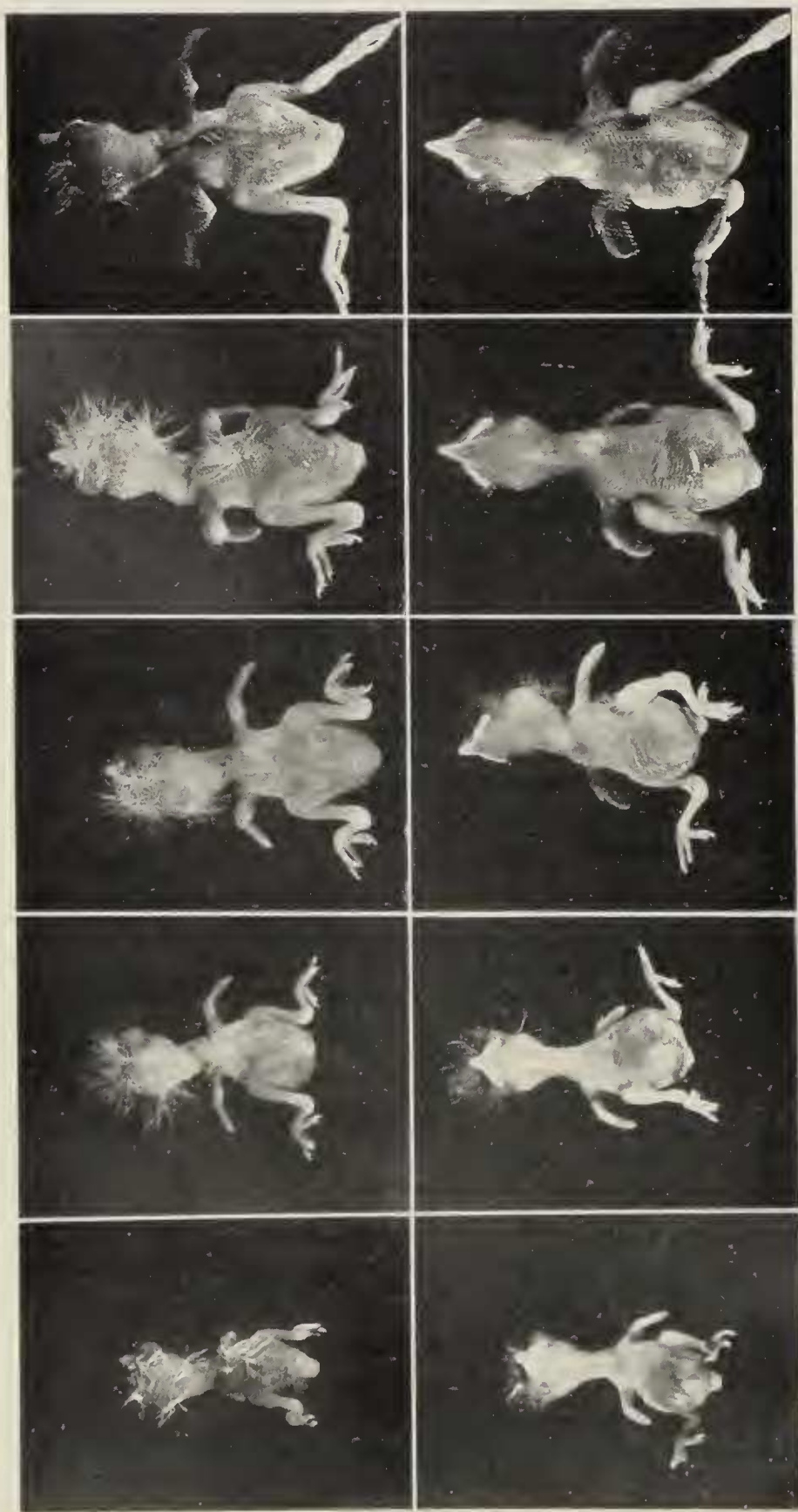


FIG. 43. Photographs showing feather tracts on successive days. Top row shows dorsal surface. Bottom row shows ventral surface. From right to left the figures show the bird at hatching, first, second, third, and fourth days.

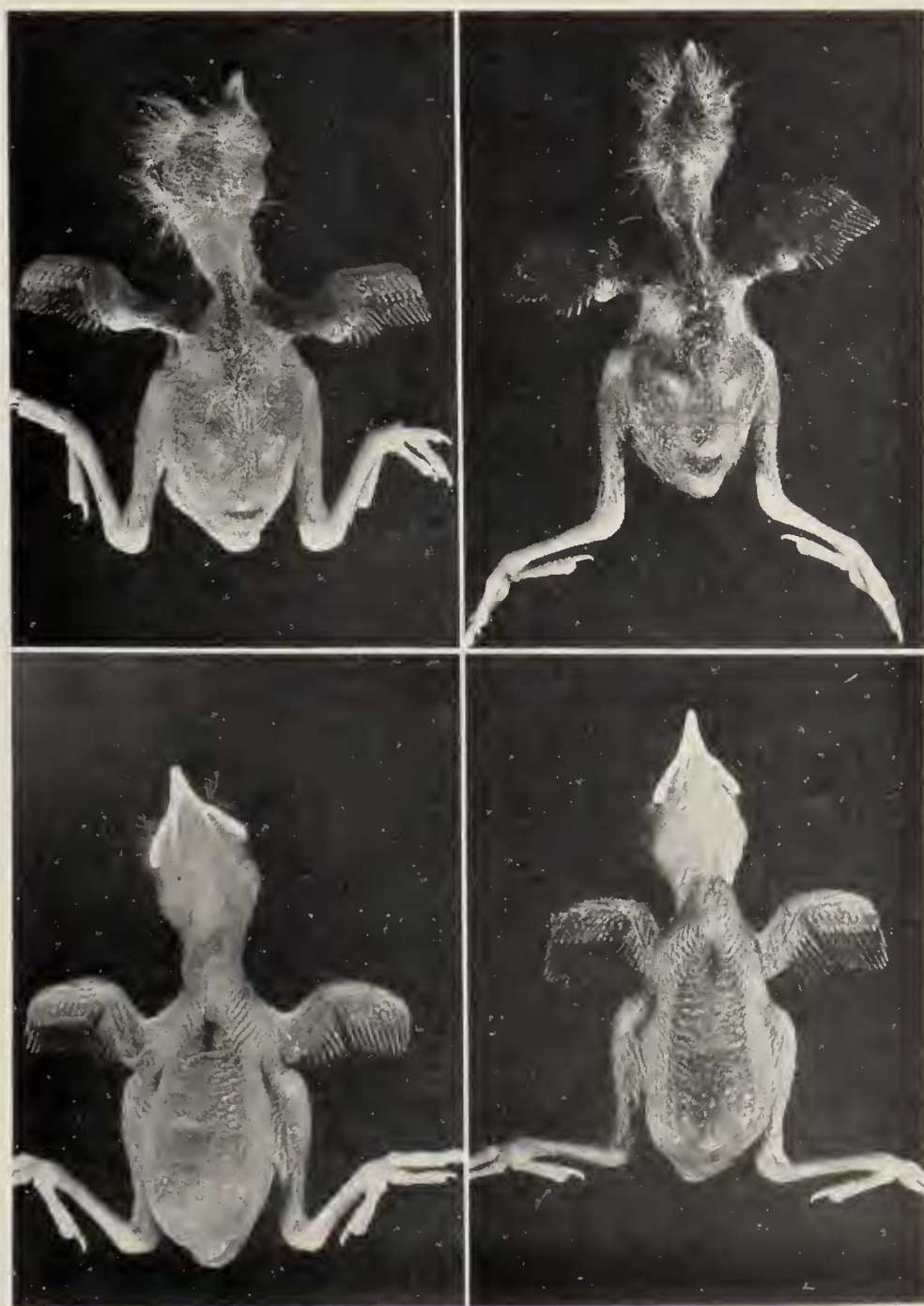


FIG. 44. Photographs showing feather tracts on successive days. Left top, fifth day, dorsal; left bottom, fifth day, ventral; right top, sixth day, dorsal; right bottom, sixth day, ventral.

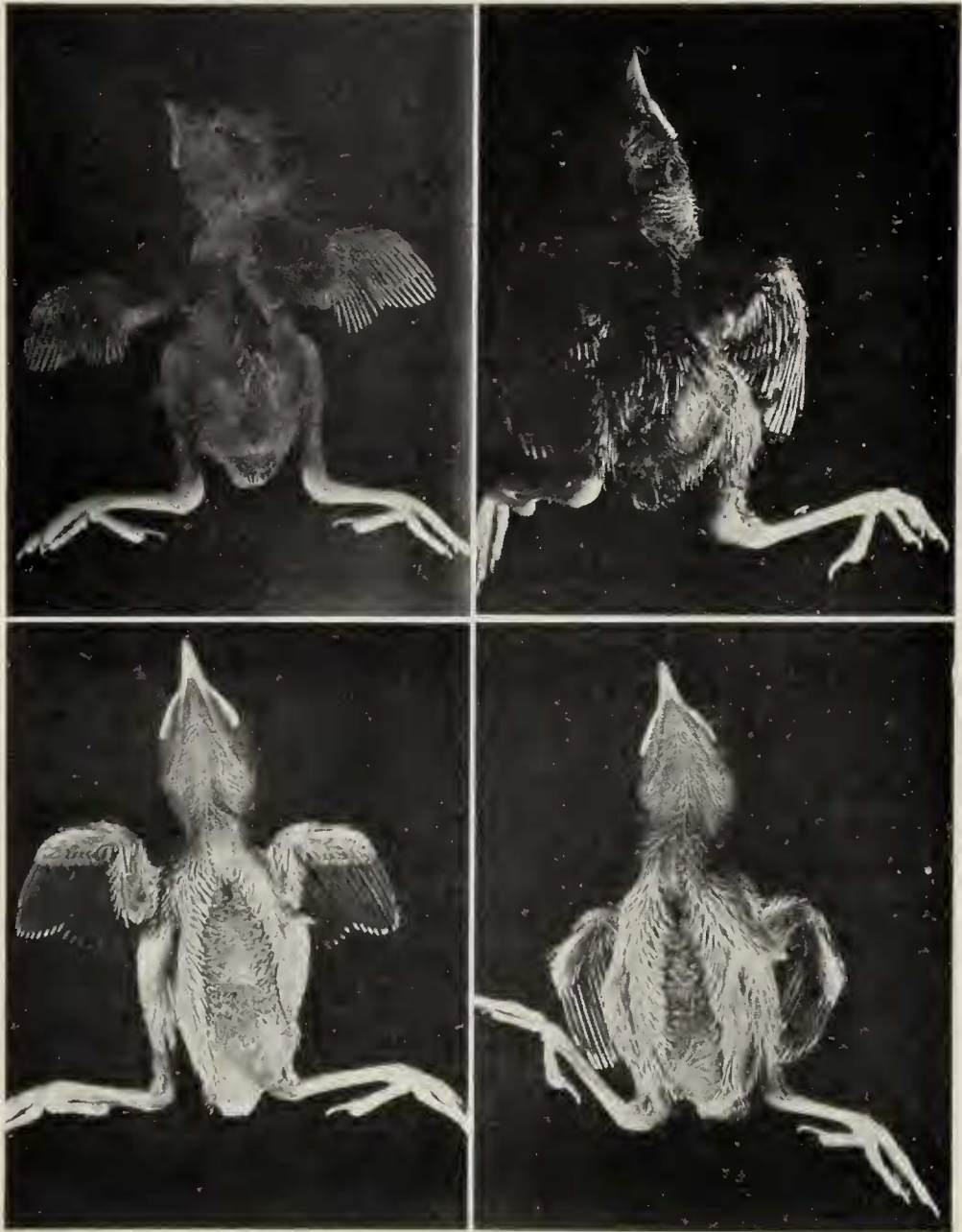


FIG. 45. Photographs showing feather tracts on successive days. Left top, seventh day, dorsal; left bottom, eighth day, ventral; right top, ninth day, dorsal; right bottom, ninth day, ventral.

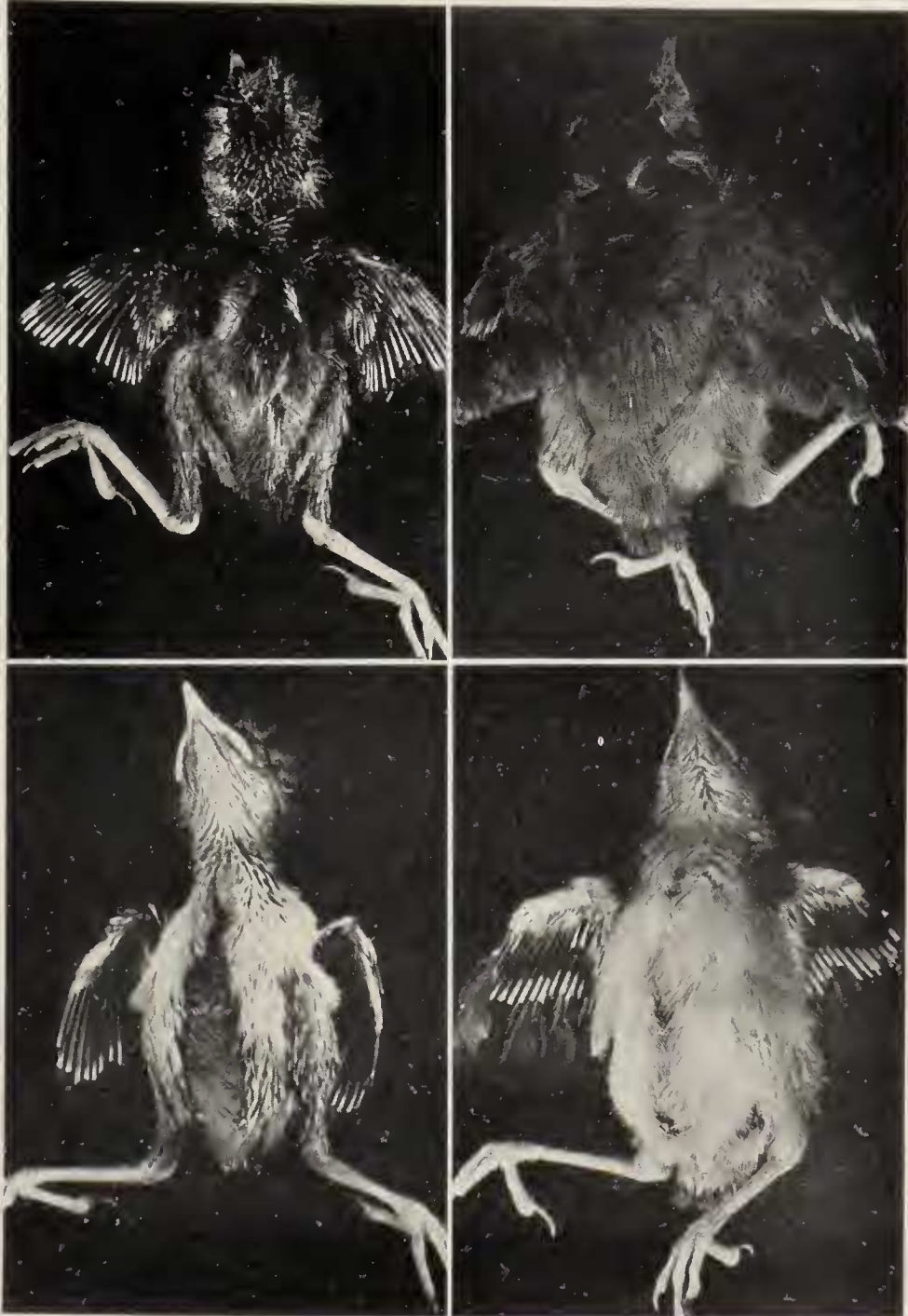


FIG. 46. Photographs showing feather tracts on successive days. Left top, tenth day, dorsal; left bottom, tenth day ventral; right top, twelfth day, dorsal; right bottom, twelfth day, ventral.

first pair, although somewhat smaller, is clearly discernible in the Marsh Wren. Boulton suggests the possibility of seven pairs of under tail-coverts in *Troglodytes*, this questionable pair is present in *Telmatodytes* and, from its position, must be regarded as a seventh pair. The first coverts in this form, also, lie above and posterior to the second.

Certain differences were observed in the alar tract. The vestigial eleventh primary mentioned by Boulton was not noted in this form. There are ten greater primary and ten middle primary coverts in *Telmatodytes* while only seven of the latter are present in *Troglodytes*, together with ten greater secondary and seven middle secondary coverts. It is impossible to determine the number of lesser coverts as they are not distinct from the marginals. The under wing-coverts are similar to those of *Troglodytes* except that there are nine middle and seven lesser secondary coverts in opposition to eight and seven, respectively, in the House Wren.

In all other details the two genera are in complete agreement. The classification used in this discussion, in the diagrams, and in the section on feather growth of the nestlings has been taken from Boulton's paper.

PLUMAGES AND MOLTS

The most complete account of the sequence of plumages in the Long-billed Marsh Wren is that of Dwight³ who is quoted at length below:

"1. Natal down. White.

"2. Juvenal plumage acquired by a complete postnatal moult. Crown, nape and part of back brownish, a few faint white lines on the nape: the scapularies, rump, and upper tail coverts Prout's-brown often russet tinged. Wings and tail dull black, the tail barred, the tertiary edgings mostly black, the coverts and secondaries brownish edged, the primaries paler with indications of barring. Sides of head dusky: a faint whitish superciliary line. Below, white, washed on sides of breast and flanks and on crissum with pale cinnamon. Bill and feet dusky pinkish becoming dusky.

"3. First winter plumage acquired by a partial postjuvenal moult, beginning about the middle of August, which involves the body plumages, the wing coverts, and the tertiaries, but not the rest of the wings nor the tail, young and old becoming practically indistinguishable. This plumage may easily be mistaken for the juvenal. Similar

³Dwight, Jonathan. The Sequence of Plumages and Moults of the Passerine Birds of New York. Ann. N. Y. Acad. Sci., 13:296-297. 1900.

to previous plumage, but the brown rustier above, a brown median line dividing the black crown; the anterior part of the back is black with distinct white streakings; the superciliary line white; the tertiaries dusker and more mottled below, the cinnamon wash is deeper with sometimes a pectoral band and there is obscure whitish and dusky barring on the sides, the crissum distinctly barred.

"4. First nuptial plumage acquired by a complete prenuptial moult as indicated by the relatively unworn condition of the feathers when the birds arrive in May. Although I have no positive evidence of this moult, spring birds are in quite as fresh plumage as those of autumn and I do not believe the latter could be so little affected by wear during the winter months as not to show more of it on their return. This plumage is the same as the last, perhaps whiter below and with less obvious barring on the flanks and crissum and it becomes badly frayed before the end of the breeding season.

"5. Adult winter plumage acquired by a complete postnuptial moult in August. Practically indistinguishable from first winter but the wings and tail usually grayer, the tertiaries and wing coverts more heavily barred.

"6. Adult nuptial plumage acquired by a complete prenuptial moult the same as in the young bird.

"Females.—The sexes are alike, the female perhaps averaging a little duller, and the moults are the same."

The writer is at variance with Dwight and Stone⁴ in certain respects concerning the manner of acquiring first winter and nuptial plumages. Juvenals collected during the fall of 1931 which are now in the Cornell Collection show a molt of both rectrices and remiges. In one specimen the three innermost primaries in both wings are beginning to come in before there is any noticeable molt elsewhere. Another specimen shows an entire new set of tail feathers just appearing while other parts of the body are well along with the molt. The remiges are worn to such an extent that they are little more than bristles at the time molt begins.

I can find no evidence of a prenuptial molt in the series of specimens examined. One individual taken in March is replacing a few crown feathers, but this seems to be an erratic case as others during the same period and even later show no such molt or fresh plumage. Birds taken during the winter months show some wear of the feathers

⁴Stone, Witmer. The Moulting of Birds with Special Reference to the Plumages of the Small Land Birds of Eastern North America. Proc. Acad. Nat. Sci., Phil., 48:164. 1895.

but this becomes more apparent during the summer. It seems to be a gradual process without any indication of renewal of plumage. As summer advances wear continues in conjunction with fading through the action of the summer sun so that it becomes impossible to distinguish certain of the races until the acquisition of the winter plumage. The amount of wear during the winter months varies to a certain extent with the individual but no specimens examined were entirely free from it. Fall birds are noticeably more plump with longer feathers than the birds which arrive in the spring.

The plumages and molts in my opinion should be given as follows:

1. Natal down.
2. Juvenile plumage acquired by a complete postnatal molt.
3. First winter plumage acquired by a *complete* postjuvenile molt.
4. First nuptial plumage *acquired by wear*.
5. Adult winter plumage acquired by complete postnuptial molt.
6. Adult nuptial plumage *acquired by wear* as in the first nuptial plumage.

ORDER OF MOLT

The primaries are the feathers that initiate the molt. The inner three are shed almost simultaneously and then one is lost at a time until all are shed. Before the primaries are entirely replaced the secondaries are shed, from the outside inward. It is impossible to give the exact order in other regions as the intervals between the various parts are very slight. The feathers of the ventral tract begin to molt before any of the other body feathers. These are followed very closely by the interscapulars and the crown feathers. The wing coverts are somewhat later than the remiges while the rectrices are lost before the last primary is shed. The tail feathers are molted in such rapid succession that it is impossible to tell which comes first and the ingrowing feathers appear approximately of the same length.

There is considerable variation in the time of molt especially among the birds of the year. Many specimens taken from August 10 to October 15 show some stage of molt. This naturally would be expected as the younger birds of the second brood are not as far advanced as the older birds.

UNUSUAL PLUMAGES

A specimen of *marianae* taken at Chassahowitska Bay, Florida. (Biol. Surv. 261977) has the fifth and eighth secondaries on the left and the eighth on the right side white. In other respects the plumage

is normal. Ray¹ reported a specimen of *paludicola* from Alameda, California, which had several crown feathers and one secondary pure white.

TABLE 1. Measurements of Nestlings (in millimeters).

	The Day	j.h.	1day	2day	3day	4day	5day	6day	7day	8day	9day	10day	11day	12day
Total length.....	31		33	38	42	50	58	60	62	64	65	71	73	74
Extent	29		31	43	45	70	75	80	82	97	100	112	114	120
Wing	4		4.5	5	6	7	11	19	19	23	25	28	30	38
Tarsus	3.5		5	7	7	10	12	14	15	16	16	19	20	21
Middle toe														
and nail.....	4		4.5	5	6	7	9	11	11	13	13	14	15	15
Nail .....	.5		.5	1	1	1	2	2.5	2.5	3	3	3	4	4
Culmen	3		3	4	4	5	6	6	6	7	7	7.5	8	9
Gonys	2		2	2	2	2	2	3	3	3	3	3.5	4	5
Gape	5		5	7.5	7.5	9	11	11	11	13	13	13	13	14
Rictus	3		3	5	5	5	7	7	7	7	7	7	7	7
6th rectrix ....	..		..	..	..	..	.1	1	2	3	4	5	7	10
3rd rectrix ....	..		..	..	..	..	.1	1	2	3	5	7	9	14
1st rectrix ....	..		..	..	..	..	.1	1	2	2	4	5	7	10
1st primary....	..		..	..	..	1	4	6.5	8	11	15	18	20	24
5th primary....	..		..	..	..	1	4	6.5	9	11	15	19	21	25
10th primary..	..		..	..	..	1	2	3.5	6	7	10	11	13	16
1st secondary..	1	4	6	8	11	14	17	19	24
4th secondary..75	3	6	8	10	13	16	18	23
8th secondary..25	2	3	4	6	10	12	13	15

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THE OCCURRENCE OF WHITE HERONS IN THE YOUNGSTOWN,
OHIO, REGION

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Since the late George L. Fordyee recorded the first American Egret to be seen at Pine Lake on July 29, 1918, other white herons have appeared frequently in the Youngstown, Ohio, area. Published records of these visitors, however, are very few. For this reason it seems desirable to place on record the pertinent facts regarding the appearances of these herons in the past sixteen years. The data here presented are from the notes of Mr. George L. Fordyee, Mr. G. M. Cook, Dr. J. G. Brody, Mr. V. McLaughlin, and the writer.

The three species concerned in this paper are the American Egret (*Casmerodius albus egretta*), Little Blue Heron (*Florida caerulea*), and the Snowy Egret (*Egretta thula thula*).

¹Ray, Milton S. Notes from Alameda, California. Bull. Cooper Ornith. Club, 1:53, 1899.